Please address the following aspects in your letter of intent

1   Binding letter of intent as advance notification or non-binding letter of intent

[Please indicate clearly whether your document is a binding letter of intent as advance notification or a non-binding letter of intent.]

☐	Binding letter of intent (required as advance notification for proposals in 2019)
Χ	Non-binding letter of intent (anticipated submission in 2020)
☐	Non-binding letter of intent (anticipated submission in 2021)

2   Formal details

- Planned name of the consortium
- **NFDI Neuro**physiology and **Function**al Brain Imaging
- Acronym of the planned consortium
- **NFDI4NeuroFunction**

- Applicant institution
- Deutsche Gesellschaft für klinische Neurophysiologie und funktionelle Bildgebung
- Spokesperson
- Prof. Dr. Otto W. Witte, otto.witte@dgkn.de, DGKN, Darmstadt

3   Objectives, work programme and research environment

- Research area of the proposed consortium (according to the DFG classification system)

  www.dfg.de/download/pdf/dfg_im_profil/gremien/fachkollegien/amtsperiode_2016_2019/fachsystematik_2016-2019_en_grafik.pdf

- 206 (Neuroscience), 205 (Medicine), specifically 206.06, -07, -08, -09]

- Concise summary of the planned consortium's main objectives and task areas

Methods of electrophysiology, as well as functional- and structural brain imaging, are among the most widespread methods in national and international research. These methods generate vast amounts of data which lends itself to collaborative exploration. Yet, relevant exchange is currently in its infancy. This is especially true for electrophysiological data. The heterogeneity of data formats, different methodological procedures, and the lack of uniformly used repositories for electrophysiology and functional brain data do not meet any of the FAIR principles - they are not findable, not accessible, not interoperable, and not re-usable. To a lesser extend this is true for collected MRI data.

Electrophysiology, as well as MRI, are multidisciplinary methods and concern a broad spectrum of scientific disciplines. In particular, clinical research in rare diseases is severely hampered by the scarcity of systematic data sharing. Particularly experimental and empirical research would be greatly stimulated by the consistent use of a comprehensive research data management framework.

The urgent need for such a framework has been a key driver for the Deutsche Gesellschaft für klinische Neurophysiologie und funktionelle Bildgebung (DGKN) to establish uniform standards throughout Germany for the methods of electrophysiology and functional imaging.

One of the most important goals in this endeavor will be the implementation of a central platform that ensures the exchange of all scientifically collected electrophysiological and MRI data, along with behavioral and clinical data. An essential prerequisite for this is the development of uniform standards for the exchange and storage of data along with the legal and informed consent limits governed by the German DGSVO (Datenschutzgrundverordnung).

Currently, there are some attempts and recommendations for the standardization for the storage of MRI data. In everyday scientific life, however, these standards are hardly used by scientist outside of coordinated programs such as the Human Connectome Project. Regarding the different methods of electrophysiological data, there are no usable standards at all. For example, EEG data is stored in more than 20 different data formats in Germany. These formats are essentially incompatible with each other. A central platform for the exchange of data therefore requires not only the establishment of a higher-level metadata format, but also methods for the automated assessment of data quality. Such standards are currently non-existent and have to be developed within this consortium. The storage of data must meet the FAIR criteria to optimize the added value of reuse. Furthermore, standardized storage also requires the homogenization of methods of data acquisition. Here we see another challenge for the consortium, which is to standardize the training of scientists who use these methods.

The consortium perceives the DGKN as optimally suited to mediate these goals and disseminate the developed technology throughout the scientific community. This requires continuous contact with users. The DGKN is a methods-oriented scientific society linking research and clinics. It has 3600 members involved in this field, including nearly all University Departments of Neurology, many University Departments of Psychiatry, and representatives from other fields like neuropsychology, computational neurosciences as well as information technology. The society has active collaborations with many international societies and institutes in the field, e.g. the Human Brain Mapping Society (HBN) and the International Federation for Clinical Neurophysiology (IFCN), supporting an international standardization of the approaches. The DGKN promotes the spread of new standards for data handling processes through guidelines, symposia and meetings, as well as with expert committees for many different aspects of the required tasks. Furthermore, the DGKN journal "Clinical Neurophysiology" achieves a high level of interdisciplinary dissemination by users of electrophysiological methods. This mechanism can be expanded to new electronic and conventional methods to spread, promote, and encourage the use of new procedures.

The close connection of the DGKN with its members as well as the broad membership base also enables the continuous and active involvement of the community in all phases of the consortium's work. Only this continuing long-term interaction with the technological and methodological needs of scientists can guarantee a permanent topicality of the services and structures that have to be developed. The everlasting process of the evolvement of the data-handling process also requires a dynamic structure of the organization that develops and promotes this technology. This is guaranteed by the DGKN's broad membership base and democratic structure. This continuous involvement of the community is considered by this consortium as the crucial building block.

Currently, the DGKN is of a central role in the training of scientists in the corresponding range of methods and aims to standardize data acquisition and to guaranty data quality. Within this consortium, we plan to coordinate this training with the new guideline of data handling and storage. This is an organic extension of the current tasks of the DGKN as it already creates guidelines for the handling of the corresponding procedures, e.g., EEG, EMG, EP, polysomnography, ultrasound. The DGKN also supports the distribution of advances in these methodological domains and new standards of data handling by organizing regular congresses and training programs.

The DGKN, together with its partners, has central responsibility for taking actions to coordinate the development of a sustainable research data infrastructure. These efforts are specific to the methods of electrophysiology and functional imaging, but as such are interdisciplinary.

The DGKN represents a democratic, organized, open structure, which as such, can ensure organizational and personal openness and a dynamic structure. Ensuring systematic and sustained access to all aspects of data generation-, handling-, storing- and sharing for the specified methods is one of the central objectives of the DGKN, which will also be included in the statutes of the society. In the democratic structure of the DGKN, scientists not only have a vote in the consortium, but they are the consortium them self, enabling proximity to users of methods and a continuous process of renewal.

In summary, the goal of this consortium is to enable a permanent, standardized exchange of electrophysiological data as well as functional- and structural imaging data. This goal requires a sustained commitment to all levels of scientific work, including the standardization of methodology (training), the creation of consistent data processing-, storing- and retention standards, as well as the ability and willingness to establish this as the standard in scientific work. This requires close contact with the community, which is guaranteed by an institution which is directly represented by the users. In association with various partners, we see the DGKN as an optimal organ to implement this project.

Brief description of the proposed use of existing infrastructures, tools and services that are essential in order to fulfill the planned consortium's objectives

The DKGN has extensive experience in the development and establishment of clinical and scientific standards. This concerns the application of methods, the training of scientists as well as the necessary tools to permanently ensure compliance with newly established standards. Measures and tools developed within the DGKN in the last 20 years that were successfully integrated into the practical application can be integrated into the work of the current consortium and made available to other consortia.

Regarding the specific storage and accessibility as well as the definition of required meta-standards, we plan to collaborate with several partners who will be integrated into the consortium. An essential prerequisite here is, however, the possibility of openness and the dynamics of pre-existing structures. First and foremost, the goal is the interaction and participation of scientific users in the development and use of research data storage.

For neuroimaging and behavioral data, the Brain Imaging Data Structure (BIDS) Initiative (https://bids.neuroimaging.io) recently introduced a consensus on the organization and exchange of data from neuroimaging experiments. The specification in BIDS offers long-term access and reuse to a broad spectrum of scientists with different backgrounds and enables platforms for the exchange of neuroimaging data such as OpenNeuro (https://openneuro.org) or Loris (http://loris.ca).

These already existing formats and initiatives could not only be a template for the development of standards that we intend in our consortium, but also a possible interface to foreign consortia.

- Interfaces to other proposed NFDI consortia: brief description of existing agreements for collaboration and/or plans for future collaboration

Close collaboration with other consortia is planned in order to ensure the greatest possible compatibility of the process to store, share, find and re-use of data in the long-term perspective.

Although defining a method-specific meta-standard would allow for the most direct solution; this would not reflect the need for a multidisciplinary and international standardization. Equally important is that every solution must be capable of adapting to the evolving needs of the scientific community.

As part of building a specific services portfolio, the ultimate goal must be to ensure maximum compatibility with other consortia and to offer only a minimum of processes related specificity for all consortium-related services. These measures aim to increase the reusability of the data of this consortium beyond the disciplinary boundaries. All services offered in this consortium must, therefore, be coordinated in close liaison with other consortia. We anticipate collaborations with several of the other consortia, e.g. NFDI4LIFE, NFDI Neuroscience and nfdi-neuro, and others.

We also plan to closely collaborate with the *DLR Institute for Data Sciences* in Jena that focuses on topics related to Data Management, IT Security and Citizen Science. We will also search connections to the consortia in the *Medical Informatics Initiative*, e.g. SMITH.

Furthermore, we plan a close cooperation in the field of science education. In this area, we see our consortium in a leading position and recognize the added value for the entire system in the existing structures of the consortium.

4   Cross-cutting topics

- Please identify cross-cutting topics that are relevant for your consortium and that need to be designed and developed by several or all NFDI consortia.

1. Standardized meta-data-formats that allow the interaction between data repositories and standards between different consortia
2. General methods and processes to ensure the broad dissemination of information to users to maximize user acceptance

- Please indicate which of these cross-cutting topics your consortium could contribute to and how.

The DGKN has many years of experience in the process of developing and long-term establishment of new methodological standards. This starts with the dissemination of newly developed standards in the form of guidelines and congresses, but also through a central organization of the training of young scientists. Furthermore, the DGKN has decades of experience in the process of evolution of methods and processes and communicating these

changes to users. We consider dissemination and long-term compliance with new standards the most important challenge of the NFDI project.